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Notes on the Herpetofauna of Western Mexico 29: Herpetofauna of Natural Protected Area "El Diente," Zapopan, Jalisco, Mexico . . . Santiago Cortés-Vázquez, Lizett Carolina Núñez-Carrillo, Daniel Cruz-Sáenz, Marco A. Carrasco-Ortiz, Andrés Rodríguez-López, David Lazcano, Lydia Allison Fucsko and Larry David Wilson 177

Notes on Reproduction of Pickerel Frogs, *Lithobates palustris* (Anura: Ranidae), from Oklahoma . . . . . Stephen R. Goldberg 186

Herpetological Art in Chattanooga's Tennessee Aquarium—June 7, 2022 . . . . . Roger Carter 190

Herpetology 2022 192

New CHS Members This Month 192

Advertisements 192

Cover: Madagascan spider tortoises, *Pyxis arachnoides arachnoides*. Marc Papiernik's photograph of four spider tortoises that he hatched in 2012 took first place in the contest at the June 29 CHS meeting.

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Notes on the Herpetofauna of Western Mexico 29: Herpetofauna of Natural Protected Area "El Diente," Zapopan, Jalisco, Mexico

Santiago Cortés-Vázquez [1], Lizett Carolina Núñez-Carrillo [1], Daniel Cruz-Sáenz [2], Marco A. Carrasco-Ortiz [1], Andrés Rodríguez-López [1], David Lazcano [3], Lydia Allison Fucsko [4] and Larry David Wilson [5]

Abstract

In this work we update the species of amphibians and reptiles known to "El Diente," which is the most visited zone by tourists inside the Natural Protected Area in Bosque El Nixticuil-San Esteban-El Diente (Bensedi). The species documented here result from five years of casual encounters and directed surveys. The authors' personal observations have been complemented with literature and digital database searches. In total we document 33 species, of which 20 are considered new registers for "El Diente" and for the Natural Protected Area in general. These results reinforce the importance of this zone, based on its conservation status and its biodiversity, particularly among amphibians and reptiles.

Resumen

En este trabajo actualizamos el listado de especies de anfibios y reptiles conocidas para "El Diente", la cual es la zona mas visitada por turistas dentro del Área Natural Protegida Bosque El Nixticuil-San Esteban-El Diente (Bensedi). Las especies documentadas aquí son resultado de cinco años de encuentros casuales y búsquedas dirigidas, estas observaciones fueron complementadas con revisión de literatura y bases de datos digitales. En total documentamos 33 especies, de las cuales 20 son consideradas nuevos registros para "El Diente" y para el Área Natural Protegida en general. Estos resultados refuerzan la importancia de esta zona para el status de conservación debido a su biodiversidad, particularmente de anfibios y reptiles.

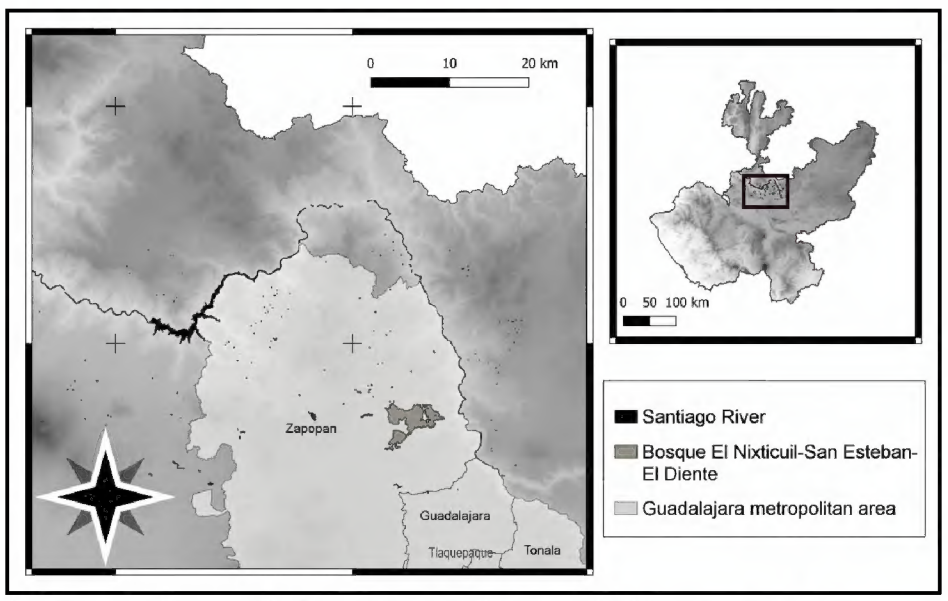
Introduction

The state of Jalisco in the western part of Mexico is home to 223 species of amphibians and reptiles (Cruz-Saenz et al., 2017). This high diversity of herpetofaunal species is in great part explained because four physiographic provinces converge in the state (INEGI, 1981), resulting in a high variety of ecosystems and, therefore, a high variety of habitats available for the herpetofauna.

The Natural Protected Area (NPA) Bosque El Nixticuil-San Esteban-El Diente, designated by the acronym BENSEDI, is currently allocated to the category of Municipal Area for Hydrologic Protection. In general, the three zones that constitute the BENSEDI are highly endangered due to urban growth, contamination of the watersheds and microwatersheds, illegal logging, and land use change, among other factors (Carrillo, 2005; Hernández and Rivera, 2009). Some efforts have been undertaken in "El Diente" by authorities and citizen groups to restore soil, control mistletoe, and to restrict the entry of motorized vehicles. However, this area is the zone most overcrowded by visitors in BENSEDI. Poor waste management, introduction of species during reforestations (e.g., *Pinus teocote*), and induced wildfires add other deleterious impact factors.

Study site

The study site is characterized by its rugged topography, in which some monoliths stand out above the canopy of the vegetation. This broken topography creates a highly heterogenous set of habitats that the herpetofauna can utilize. "El Diente" pres-



Location of Bosque El Nixticuil-San Esteban-El Diente within the Guadalajara metropolitan area,

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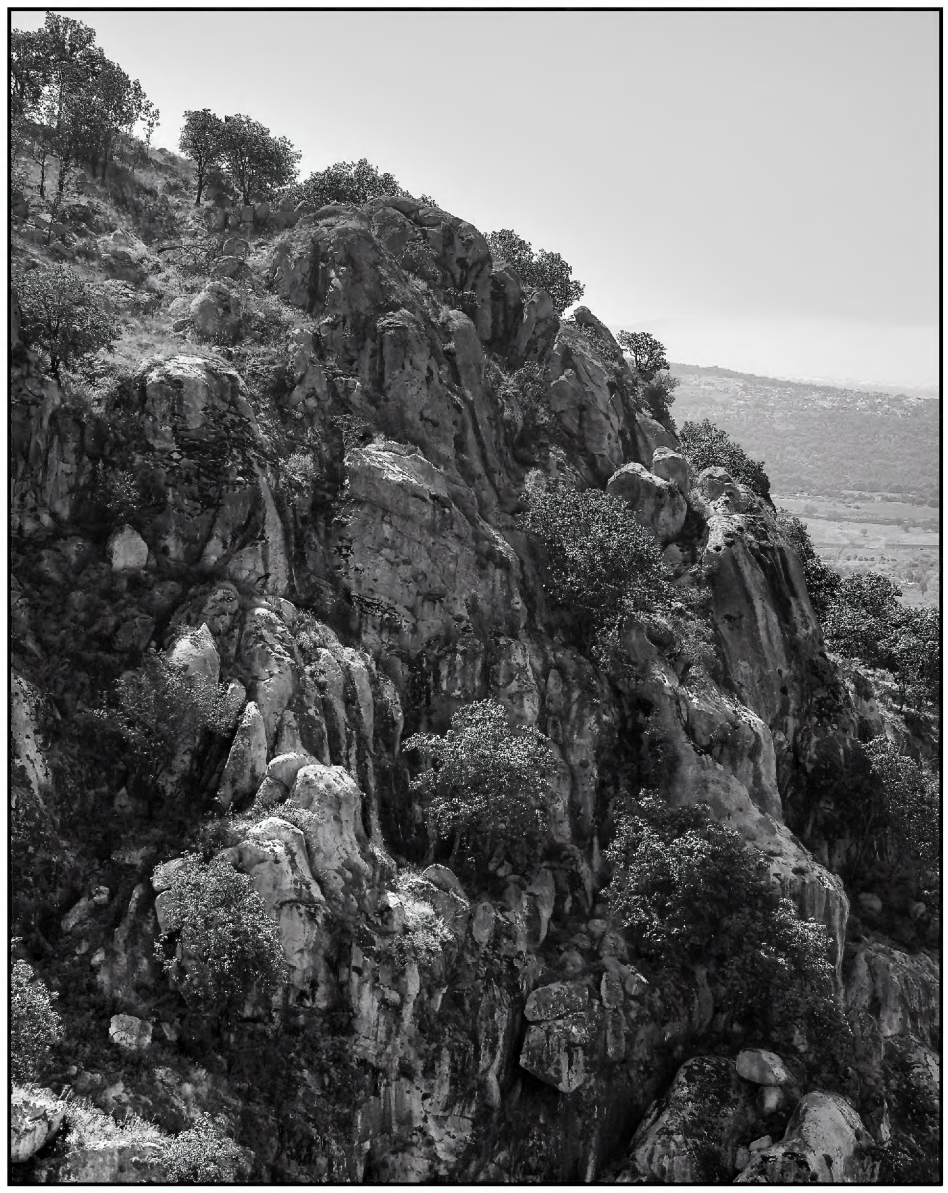
4. Department of Humanities and Social Sciences, Swinburne University of Technology, Melbourne, Victoria, Australia. lydiafucsko@gmail.com (LAF).

5. Centro Zamorano de Biodiversidad, Escuela Agrícola Panamericana Zamorano, Departamento de Francisco Morazán, Honduras; 1350 Pelican Court, Homestead, Florida 33035-1031, USA. bufodoc@aol.com (LDW).

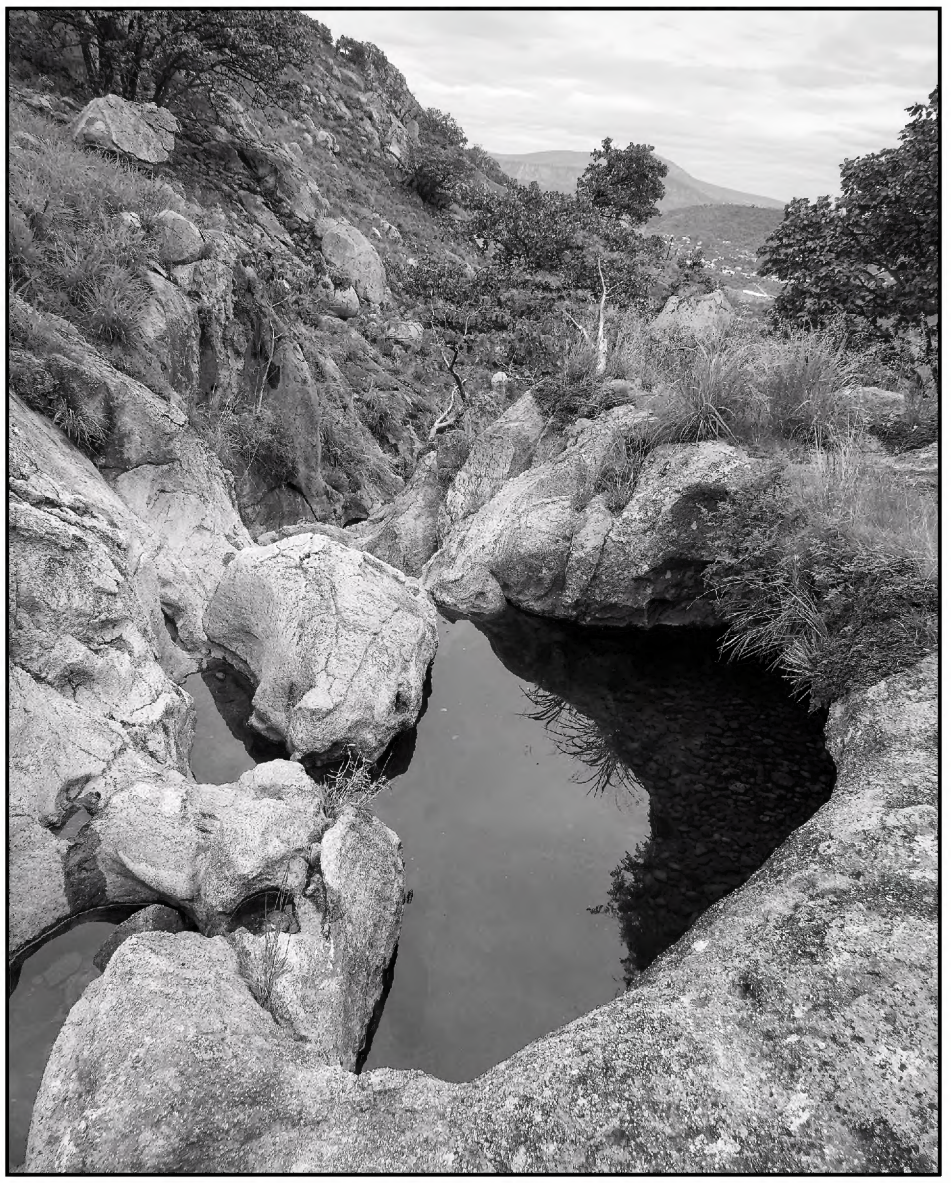
"El Diente" plant communities mainly comprise oak forests, with some patches of grassland probably induced by agricultural activity. Temporary streams are also present.

"El Diente" is located on what is known as the Cerro de San Esteban, characterized by hills with rocky slopes of varying steepness.



This site is frequented for rock climbing.

Many plant communities in "El Diente" have been affected by frequent forest fires, resulting in large bands of low vegetation.



Semi-permanent pools are present, providing water for the native fauna..

Rhyolite, an extrusive igneous rock, is main type of rock at this site, providing refuges for herpetofauna.

There are farms nearby, so it is not uncommon to observe cattle grazing in this area.

The rock walls of some narrow ravines favor the retention of moisture. Mosses and ferns may grow there.

ents the following plant communities: Deciduous Tropical Forest, Oak Forest, Oak Forest with Grassland, Oak-pine Forest, Gallery Forest, Induced Natural Grassland, and Secondary Vegetation.

For this study site, there are no previous published works focused upon documentation of the local herpetofauna, nor is there available literature related to the decree by which "El Diente" was established as part of the NPA (Gobierno de Jalisco, 2008). Although a thesis from 1992 (Ayala-Telles, 1992) documented 12 herpetofaunal species, two of them solely to the generic level (*Rana* sp. and *Crotalus* sp.), the zone of the BENSEDI where these encounters took place is not specified. Although these documents provide very valuable information about the biodiversity of this NPA, it is necessary to expand and update the knowledge of this area in order to support more efficacious conservation measures.

Methods

During the years 2016 and 2021, we registered the amphibian and reptile species observed during occasional encounters and directed surveys; the species list was complemented with records obtained from the literature and from digital databases. Given that most records were the product of casual encounters, the data obtained do not allow us to undertake a robust ecological analysis, so we researched the available literature in a Mexican law (SEMARNAT, 2010) and on digital platforms (e.g., IUCN, 2021) to gather information that allowed us to describe: (1) the occupancy that the various species have in the different vegetation communities present in the study site; (2) the status of the species according to Mexican law (SEMARNAT, 2010); (3) the classification using the Environmental Vulnerability Score (EVS) (Wilson et al., 2013a, 2013b; Cruz-Saenz et al., 2017); (4) the status according to the International Union for Conservation of Nature (IUCN, 2021); and (5) the identification of the level of endemism of the species.

Finally, we explored the relation of the previous herpetofaunal records at the study site and the observations made by the authors of this work. We registered new records for "El Diente" and for the Natural Protected Area BENSEDI according to the following criteria: (1) whenever the listed species haven't been previously recorded; (2) whenever the species haven't been previously identified at the species level; (3) whenever the name of the taxon has undergone modifications due to taxonomic changes; and (4) whenever the record had been uploaded to digital platforms, but was not mentioned in scientific literature.

Results

In total we recorded 33 herpetofaunal species for the study area, of which we observed a total of 29. Nineteen were found in literature and database research; 20 are considered new records. The amphibians comprise nine species belonging to five families and the reptiles consisted of 24 species in 12 families. Eight of the 33 species are listed as protected, threatened or endangered by SEMARNAT (2010); 10 have an EVS score that positions them as highly vulnerable, and 21 species are considered endemic to Mexico (Table 1).

Discussion

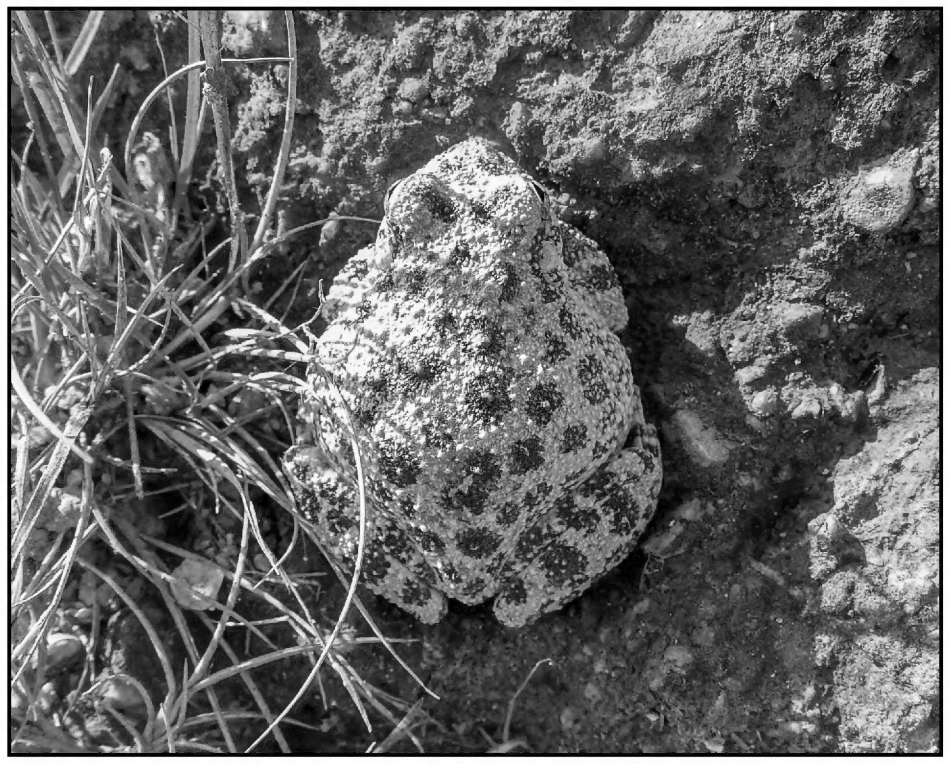
This is the first paper documenting the amphibians and reptiles that inhabit "El Diente," and although most of the observations were the result of casual encounters and were only conducted inside a small portion of the BENSEDI, these increased by 2.5 times the number of known species for the whole NPA, reinforcing the need for the conservation of these biological groups in the area, which enthused us to expand the study area for the future, in order to document the complete species composition in this NPA. The high diversity of herpetofaunal species can be explained largely due to this NPA's location near the transitional region between the physiographic subprovinces of the Central Plateau and the Transversal Neovolcanic Belt, according to the proposed delimitations of these subprovinces in Jalisco (Cruz-Sáenz et al., 2017). Conditions that propitiate a high heterogeneity in habitats available for amphibians and reptiles might explain why we documented species with very contrasting habits (Table 1).

Of the species documented as new for the NPA, one, *Plestiodon callicephalus*, was neither found in a digital database, nor found in the literature, nor observed by any author of this work.

Table 1. Amphibian and reptile species recorded in "El Diente," within the Natural Protected Area BENSEDI, in Jalisco, Mexico. Species endemic to Mexico are indicated by a dagger (†) following the species name. New records for "El Diente" are indicated by an asterisk (*) following the species name. **NOM** = protection status under NOM-ECOL-059-2010 (SEMARNAT, 2010): Pr = *protección especial* (special protection); A = *amenazada* (threatened); P = *en peligro de extinción* (endangered). **IUCN** = protection status according to the International Union for Conservation of Nature (IUCN, 2017): LC = least concern; EN = endangered; DD = data deficient; NE = not evaluated. **EVS** = Environmental Vulnerability Score sensu Wilson et al. (2013a, b): L = low risk (3–9); M = medium risk (10–13); H = high risk (14–20). **Habitat preference** (based on personal observations and IUCN data): RA = rocky areas; PISP = permanent and intermittent streams/pools; DTF = deciduous tropical forest; OF = oak forest; OFG = oak forest with grassland; OPF = oak-pine forest; GF = gallery forest; ING = induced natural grassland; SV = secondary vegetation.. **Reference** = basis for including the species: po = personal observation; Nat = iNaturalist. The symbol ‡ in this section indicates that the reference did not specify the species (e.g., *Crotalus* sp.).

Family	Species	NOM	IUCN	EVS	Habitat preference	Reference
Amphibians						
Bufonidae	*Anaxyrus compactilis*†	-	LC	H(14)	RA, DTF, OFG, ING	po; Gobierno de Jalisco (2008)
	Incilius occidentalis†	-	LC	M(11)	DTF, GF, ING, SV	po; Gobierno de Jalisco (2008)
Craugastoridae	*Craugastor hobartsmithi*†	-	LC	H(15)	OF, OPF, OFG, GF	Gobierno de Jalisco (2008)
	Craugastor occidentalis†	-	DD	M(13)	OF, OPF, OFG, GF	po; Gobierno de Jalisco (2008)
Hylidae	*Dryophytes arenicolor*	-	LC	L(7)	RA, PISP, GF	po; Gobierno de Jalisco (2008)
	Dryophytes eximius†	-	LC	M(10)	DTF, ING, GF, SV	po; Gobierno de Jalisco (2008)
	*Smilisca fodiens**	-	LC	L(8)	DTF, OFG, ING,	po
Microhylidae	*Hypopachus variolosus**	-	LC	L(4)	PISP, DTF, SV, ING	po
Ranidae	*Lithobates neovolcanicus*†*	A	LC	M(13)	PISP, ING	po; Gobierno de Jalisco (2008)
Reptiles						
Anguidae	*Elgaria kingii**	Pr	LC	M(10)	DTF, ING, OF	po
Colubridae	*Drymarchon melanurus**	-	LC	L(6)	PISP, DTF, SV	po
	Lampropeltis polyzona†*	-	LC	M(11)	DTF, ING	Ayala-Telles (1992)
	*Masticophis mentovarius**	A	LC	L(6)	DTF, ING, SV	po
	Pituophis deppei†	A	LC	H(14)	DTF, ING, SV	po; Ayala-Telles (1992)
	*Senticolis triaspis**	-	LC	L (6)	RA, OF, GF, DTF	po
	Sonora mutabilis†*	-	LC	H(14)	ING, DTF, OF, OPF, GF	po
Natricidae	*Storeria storerioides*†*	-	LC	M(11)	RA, OF, OPF, GF	po
	*Thamnophis cyrtopsis**	-	LC	L(7)	RA, PISP, DTF, OF, OPF	po; Ayala-Telles (1992)‡
	Thamnophis melanogaster†*	A	EN	H(15)	PISP, GF	po; Ayala-Telles (1992)‡
Iguanidae	*Ctenosaura pectinata*†*	A	LC	H(15)	RA, DTF	po
Kinosternidae	*Kinosternon integrum*†	Pr	LC	M(11)	PISP, ING	po; Gobierno de Jalisco (2008)
Dactyloidae	*Norops nebulosus*†	-	LC	M(13)	DF, OF, OPF, GF	po; Gobierno de Jalisco (2008)
Phrynosomatidae	*Sceloporus albiventris*†*	-	NE	H(16)	RA, DTF, ING, SV	po
	Sceloporus horridus†	-	LC	M(11)	RA, DTF, ING, SV	po; Gobierno de Jalisco (2008)
	Sceloporus melanorhinus†*	-	LC	L (9)	OF, OPF, GF	po
	Sceloporus spinosus†	-	LC	M(12)	RA, DTF, OF, SV	po; Gobierno de Jalisco (2008)
	Sceloporus torquatus†	-	LC	M(11)	RA, DTF, OF, OPF, ING, SV	po; Ayala-Telles (1992); Gobierno de Jalisco (2008)
	Urosaurus bicarinatus†*	-	LC	M(12)	DTF, OF, OPF	po
Phyllodactylidae	*Phyllodactylus lanei*†*	-	LC	H(15)	RA, DTF, OF, GF	po
Scincidae	*Plestiodon callicephalus**	-	LC	M(12)	RA, OF, OPF	Nat
Teiidae	*Aspidoscelis gularis*	-	LC	L(9)	RA, DTF, OF, OFG, ING, SV	po; Gobierno de Jalisco (2008)
Viperidae	*Crotalus basiliscus*†*	-	LC	H(18)	DTF, OF, OPF ING, SV	Ayala-Telles (1992)‡
Xantusiidae	*Xantusia sanchezi*†*	P	LC	H(16)	RA, DTF, OF	po

However, due to the distribution of this species and online photographic evidence, we decided to consider it as new record (Naturalista, 2020). Regarding the species reported in the literature at solely the generic level, such as *Rana* sp. (Gobierno de Jalisco, 2008) and *Crotalus* sp. (Ayala-Telles, 1992), in the first case we consider that this species might be *Lithobates neo-*



Canyon treefrog, *Dryophytes arenicolor*, tightly nestled on a rock.

Transverse volcanic leopard frog, *Lithobates neovolcanicus*.

volcanicus, as we have found it with high frequency during both the dry and rainy season, in the permanent and intermittent water bodies dispersed in the plains and stream channels of the site, and for *Crotalus* sp., given the distribution and habitat type, we consider that this might be *Crotalus basiliscus*, although we have not found this species at the study site. According to personal communication with inhabitants of Rio Blanco, we were assured us that rattlesnakes with a darkish tail can be found on dirt roads near "El Diente."

In this paper we document two species in the genus *Thamnophis*, *T. cyrtopsis* and *T. melanogaster*, which probably were recorded previously as *Thamnophis* sp. (Ayala-Telles, 1992), but according to our criteria both observations are considered new records for the area. In the case of *Lampropeltis polyzona*, this species was originally reported as *L. triangulum* (Ayala-Telles, 1992); however, this genus had undergone changes in its taxonomy since then (Ruane et al., 2014). We list 10 snake species in this paper, although their encounters are mostly rare, and this could indicate a decrease in their populations or their activity, which we believe could be the result of a lack of empathy toward these reptiles from visitors and local inhabitants.

Conclusions

We report herein 18 new herpetofaunal species records for the "El Diente" area and for the BENSEDI Protected Natural Area in general, for a total of 33 species. It is important to expand the study site to document further this herpetological richness and that of the two remaining areas of the NPA (El Nixticuil and San Esteban). Such data and conclusions should be considered for urban development plans in the future.

As is evident in Table 2, this area represents one of the lowest in species richness compared to other nearby sites; however, it also harbors a large number of very important endemic species. We must take greater care of the area and this site, since its proximity to the metropolitan area of Guadalajara creates great pressure, due to constant real estate development in its surroundings, as well as the increase in visitors to the area. This is a highly frequented place for recreational activities. Tourists and others are encouraged to come to escape from the stress of living in the metropolitan areas; many cities elsewhere in Mexico and the rest of the world regrettably are also suffering from the same effects (Cooper et al., 2021).

Reflection

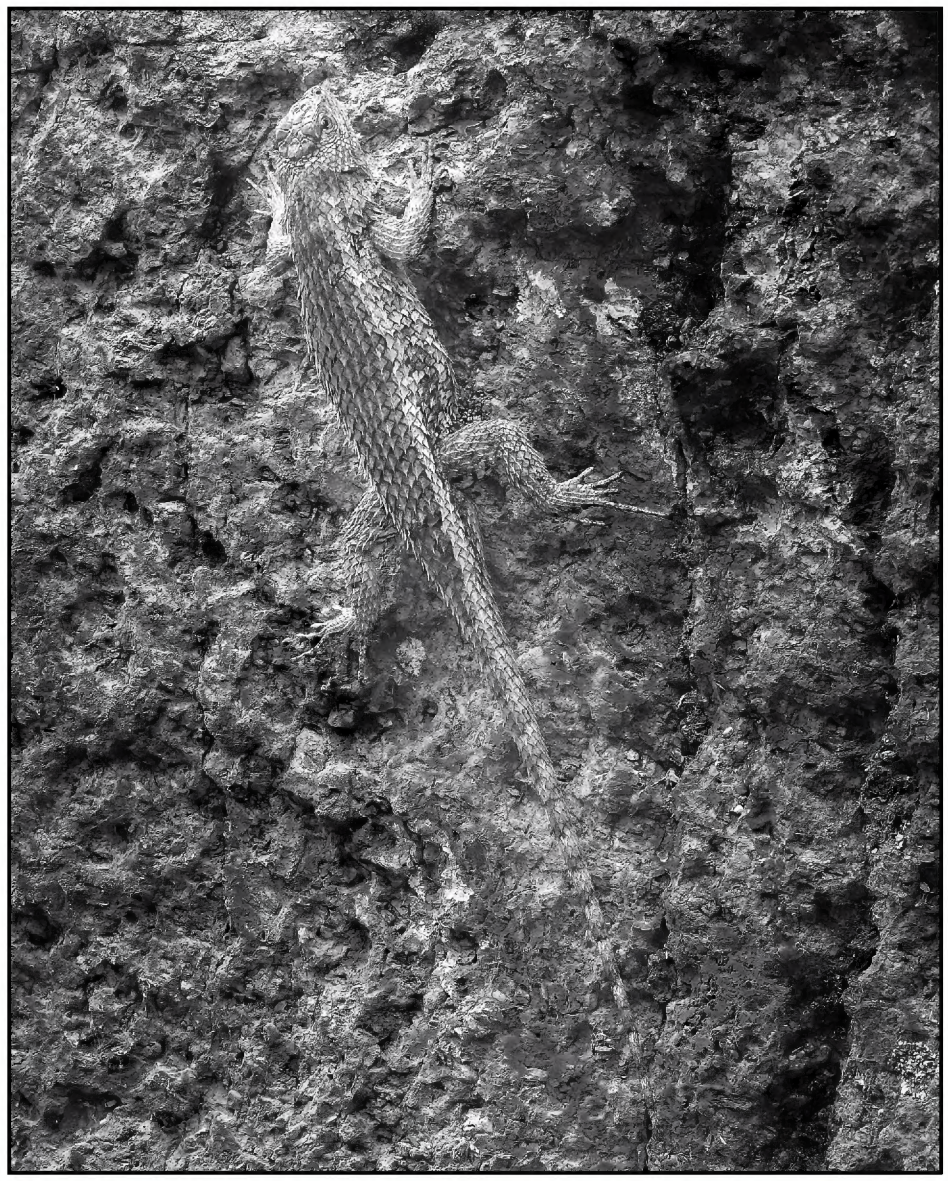
The growth of the human population inevitably has led to an increase in the concentration of a portion of the population in the cities, which growth each day absorbs more wild areas. Many areas that were considered natural are now part of the metropolitan area of Guadalajara. The "Los Colomos" forest, The Santiago Rio canyon, and, little by little, the "La Primavera" forest, have been trapped within the urban stain. All the sites mentioned above are Natural Protected Areas that now play

Table 2. Comparison of species richness and numbers of Mexican protected and endemic species from "El Diente" with surrounding areas in Jalisco that have been studied in the past.

Locality	Species richness	Protected species	Endemic species	References
El Diente	33	8	21	This paper
Huaxtla	36	10	19	Cruz et al., 2011
Bosque La Primavera	56	17	13	Reyna-Bustos et al., 2007
Hostotipaquillo, Jalisco	61	21	28	Flores-Covarrubias et al., 2012
Volcán de Tequila	31	18	22	Rojo-Gutiérrez et al., 2018
Arcediano	44	21	24	Cruz-Sáenz et al., 2009
Palo Gordo	55	16	34	Rojo-Gutiérrez et al., 2022

Lowland burrowing treefrog, *Smilisca fodiens*, watching us as we encountered it.

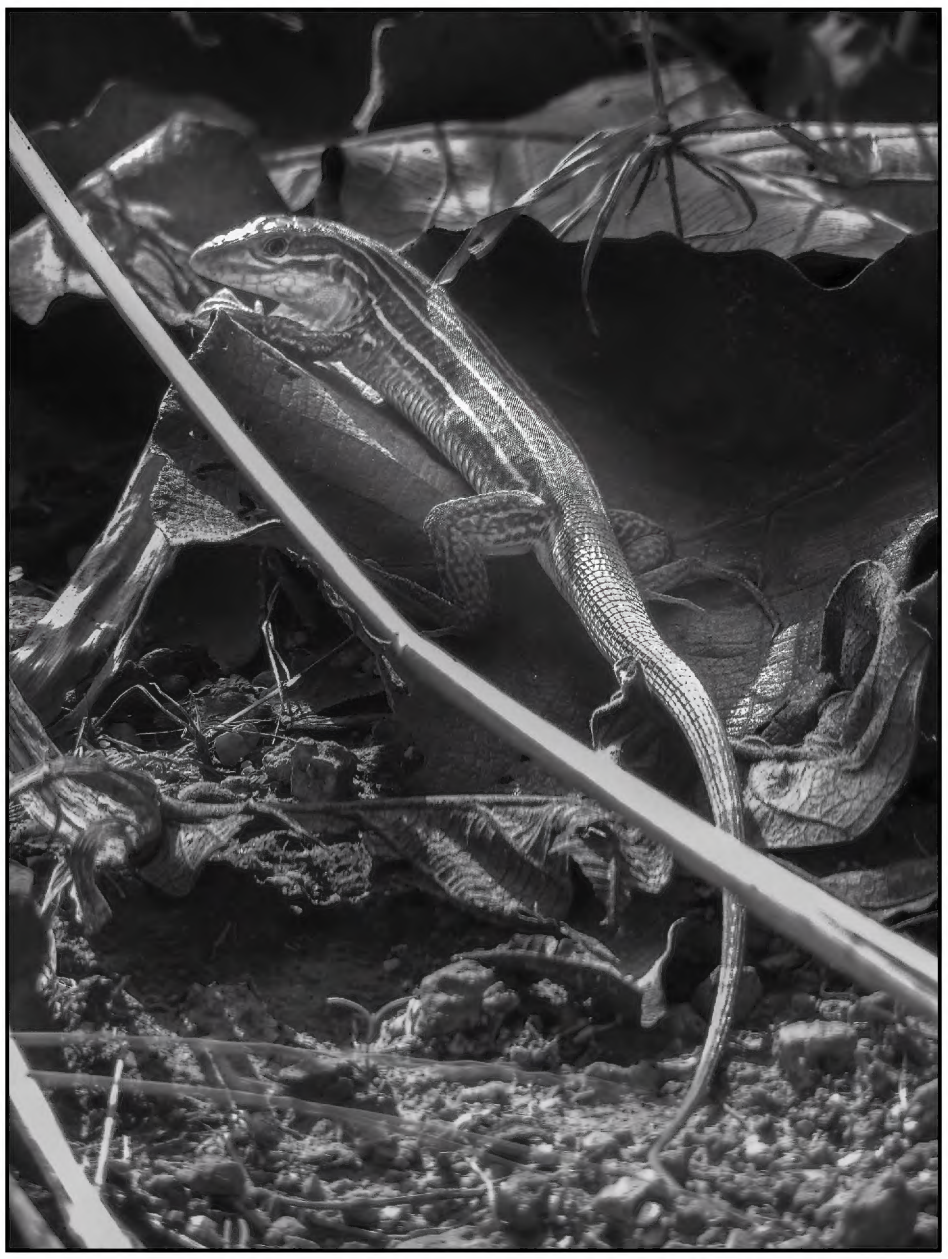
Sheep frog, *Hypopachus variolosus*, one of the noisiest frog species.



White-bellied rough lizard, *Sceloporus albiventris*, basking on a rock.

Clouded anole, *Norops nebulosus*, beneath oak trees.

Mexican brown snake, *Storeria storerioides*.



Mexican Plateau spotted whiptail, *Aspidoscelis gularis*, moving through the leaf litter.

Jalisco groundsnake, *Sonora mutabilis*. This small snake occurs in several beautiful color morphs.

the role of large parks within the city. The wildlife sheltered within these places is now trapped on an island surrounded by avenues, roads, and subdivisions that do not allow the creatures to freely move. There are no corridors that will permit exchange

Black-bellied gartersnake, *Thamnophis melanogaster*.

Black-necked gartersnake, *Thamnophis cyrtopsis*.

of genes among populations. Only a few species such as birds are saved from this eventuality.

The same situation is happening with "El Diente" a Natural Protected Area that was previously on the outskirts of the city. Now one can take a bus to this place. Of great importance is to understand this phenomenon and allow for the creation of biological corridors for the well-being of the wildlife. This situation can be improved with adequate urban planning, leaving areas where no type of construction is authorized and, on the contrary, conservation or low-impact agricultural activities are encouraged through government programs.

The Metropolitan Area of Guadalajara (MAG) comprises the municipalities of San Pedro Tlaquepaque (270 km^2), Tonalá (156 km^2), Zapopan (893.2 km^2), Tlajomulco de Zúñiga (636.9 $km^{2)}$, El Salto (41.5 km^2), Juanacatlán (89.8 km^2), Ixtlahuacán de los Membrillos (184.2 km^2), Acatlán de Juárez (166.7 km^2), Zapotlanejo (643.02 km^2), and the aforementioned Guadalajara (187.9 km^2), covering an area of 3,269.22 km^2, which represents a total extension 0.04% of the state of Jalisco terrestrial cover, which is (78,588 km^2). In 2020 in the MAG there were 5,268,642 inhabitants (Gobierno de México, 2020), with an annual growth rate of 1.7% (INEGI, 2020). We hope that the populations of the MAG and other cities of Mexico will stabilize and shrink eventually with the decades (Kemper and Royce,

A basking Mexican mud turte, *Kinosternon integrum*.

1979; Aguilar, 1999; Sousa-Gonzalez, 2007; Agueda, 2018; World Bank, 2020; Di Pietro, 2021).

Acknowledgments

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Notes on Reproduction of Pickerel Frogs, *Lithobates palustris* (Anura: Ranidae), from Oklahoma

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Abstract

I conducted a histological examination of gonads from 18 *Lithobates palustris* adults from Oklahoma. consisting of 2 males and 16 females. Males contained sperm during the two months examined, March and April. Females in spawning condition, (containing mature oocytes), were found in the five months examined: March, April, May, September and October. The smallest mature female, in spawning condition, measured 53 mm SVL and was from September. Atretic oocytes were noted in 3 of 16 (19%) of the *L. palustris* females.

Lithobates palustris (LeConte, 1825) occurs in Eastern North America from southern Canada, through eastern Minnesota, south to eastern Texas, east to South Carolina to western Florida (Frost, 2022). In Oklahoma it occurs in two disjunct populations; one in the southeast and one in the Ozark Mountains; it breeds from late April to mid-May (Sievert and Sievert, 2021). My study was based on examination of *L. palustris* from southeastern Oklahoma only. Egg masses are attached to dead or living submerged vegetation near the surface (Tipton et al., 2012). Wright and Wright (1933) reported *L. palustris* reproduction (no specific locality) occurred April 23 to May 15. Timing of the breeding season follows a south–north cline: December–May (south); March to May (mid-range); May–June (north) (Redmer, 2005). The biology of *L. palustris* is summarized in Schaaf and Smith (1971). In the current paper I present data on the *L. palustris* reproductive cycle from a histological examination of gonadal material from Oklahoma. Utilization of museum collections for obtaining reproductive data avoids removing additional animals from the wild.

A sample of 18 *L. palustris* from Oklahoma, collected 1963 to 2017, consisting of 2 adult males (mean SVL = 61.5 mm ± 3.5 SD, range = 59–64 mm) and 16 adult females (mean SVL = 68.0 mm ± 7.1 SD, range = 53–78 mm) was examined from the herpetology collection of the Sam Noble Museum of Natural History (OMNH), Norman, Oklahoma USA (Appendix). An unpaired *t*-test was used to test for differences between adult male and female SVLs (Instat, vers. 3.0b, Graphpad Software, San Diego, CA).

A small incision was made in the lower part of the abdomen of the 18 adults and the left testis was removed from males and a piece of the left ovary from females. Gonads were embedded in paraffin, sections were cut at 5 μm and stained with Harris hematoxylin followed by eosin counterstain (Presnell and Schreibman, 1997). Histology slides were deposited at OMNH.

There was no significant difference between mean SVL of adult males versus adult females of *L. palustris* ($t = 1.25$, df = 16, $P = 0.23$). The testicular morphology of *L. palustris* is similar to that of other anurans as described in Ogielska and Bartmańska (2009a). Within the seminiferous tubules, spermatogenesis occurs in cysts which are closed until the late spermatid stage is reached; cysts then open and differentiating sperm reach the lumina of the seminiferous tubules (Ogielska and Bartmańska, 2009a). Both *L. palustris* adult males were undergoing sperm formation (= spermiogenesis) in which clusters of sperm filled the seminiferous tubules. A ring of germinal cysts was located on the inner periphery of each seminiferous tubule. By month, numbers of *L. palustris* males (N = 2) exhibiting spermiogenesis were: March (N = 1), April (N = 1). Wright and Wright (1933) reported adult *L. palustris* males ranged from 46 to 64 mm in body size.

The ovaries of *L. palustris* are typical of other anurans in consisting of paired organs located on the ventral sides of the kidneys; in adults they are filled with diplotene oocytes in various stages of development (Ogielska and Bartmańska, 2009b). Mature oocytes are filled with yolk droplets; the layer of surrounding follicular cells is thinly stretched. All 18 females were in "Ready to Spawn Condition" in which mature oocytes predominated. By month these were March (N = 10), April (N = 2), May (N = 1), September (N = 4), October (N= 1). The smallest mature female *L. palustris* (ready to spawn) measured 53 mm SVL (OMNH 35609) and was from September. Wright and Wright (1933) reported adult *L. palustris* females ranged from 49 to 79 mm in body size.

Atretic follicles were noted in the ovaries of 3 of 16 (19%) of the *L. palustris* females. Atresia is a widespread process occurring in the ovaries of all vertebrates (Uribe Aranzábal, 2009). It is common in the amphibian ovary (Saidapur, 1978) and is the spontaneous digestion of a diplotene oocyte by its own hypertrophied and phagocytic granulosa cells which invade the follicle and eventually degenerate after accumulating dark pigment (Ogielska and Bartmańska, 2009b). See Saidapur and Nadkarni (1973) and Ogielska et al. (2010) for a detailed description of follicular atresia in the frog ovary. Atresia plays an important role in fecundity by influencing numbers of ovulated oocytes (Uribe Aranzábal, 2011).

Lithobates palustris females from Oklahoma undergo autumn vitellogenesis (September–October) although no fall reproduction has been reported for this species in previous studies (Table 1). Meshaka et al. (2012) similarly reported *L. palustris* females from Pennsylvania overwintered with ripened eggs and Resetarits and Aldridge (1988) reported September females from Missouri contained mature eggs. Autumn vitellogenesis has been reported to occur in other North American frogs: *Rana boylii* (Zweifel, 1955; Goldberg, 2019a) and *Rana luteiventris* (Goldberg, 2019b). It appears to be advantageous for frogs to be capable of spawning soon after emergence from hibernation, rather than needing

Table 1. Months of breeding by locality for *L. palustris* from the United States and Canada.

Location	Breeding period	Source
Alabama	winter–early spring	Mount, 1975
Arkansas	winter–spring presumably	Trauth et al., 2004
Canada, no specific locality	mid to late spring	Fisher et al., 2007
Carolinas and Virginia	late winter–early spring	Beane et al., 2010
Connecticut	April–May	Klemens, 1993
eastern/central North America	March to May	Conant and Collins, 1998
Georgia	winter–spring	Jensen et al., 2008
Great Lakes Region	April	Harding, 1997
Illinois	spring	Phillips et al., 2022
Indiana	March	Minton, 2001
Iowa	late April into May	LeClere, 2013
Kansas	March–April	Collins et al., 2010
Kentucky	March to May	Barbour, 1971
Louisiana	early February to April	Dundee and Rossman, 1989
Louisiana	December to March	Boundy and Carr, 2017
Maine	late April to early May	Hunter et al., 1999
Maryland	March to June	Cunningham and Nazdrowicz, 2018
Michigan	April or early May	Holman, 2012
Minnesota	April–May	Moriarty and Hall, 2014
Missouri	March to May	Johnson, 2000
New Brunswick	April and May	Gorham, 1970
New England	March to May	DeGraaf and Rudis, 1983
New York	April–May	Wright, 1914
New York	April–May	Gibbs et al., 2007
no specific locality	April–May	Wright and Wright, 1933
North Carolina	February to April	Dorcas et al., 2007
Nova Scotia	May	Gilhen, 1984
Ohio	March to May	Walker, 1967
Oklahoma	April to May	Sievert and Sievert, 2021
Pennsylvania	mid-April to late May	Hulse et al., 2001
Quebec and Maritimes	May and June	Desroches and Rodrigue, 2004
Rhode Island	soon after spring emergence	Raithel, 2019
Southeast	begins December (south) begins March or April (north) usually ends by May	Dorcas and Gibbons, 2008
Tennessee	February through May	Niemiller and Reynolds, 2011
Texas	December–May	Tipton et al., 2012
Wisconsin	May	Vogt, 1981

to undergo a period of yolk deposition. Jørgensen et al. (1979) reported ovaries are close to breeding size, by the time of hibernation, in frogs from the temperate zone.

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Appendix

Eighteen *L. palustris* from Oklahoma examined (by county) from the herpetology collection of the Sam Noble Museum (OMNH), The University of Oklahoma, Norman, Oklahoma.

Atoka: OMNH 39231; **Bryan:** OMNH 32719; **Leflore:** OMNH 35586, 41724, 43302–43304, 43461 43598, 43599, 43600; **McCurtain**: OMNH 35608, 35609, 43463; **Pushmataha**: OMNH 43466–43468, 47291.

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Herpetological Art in Chattanooga's Tennessee Aquarium—June 7, 2022

Photos and story by
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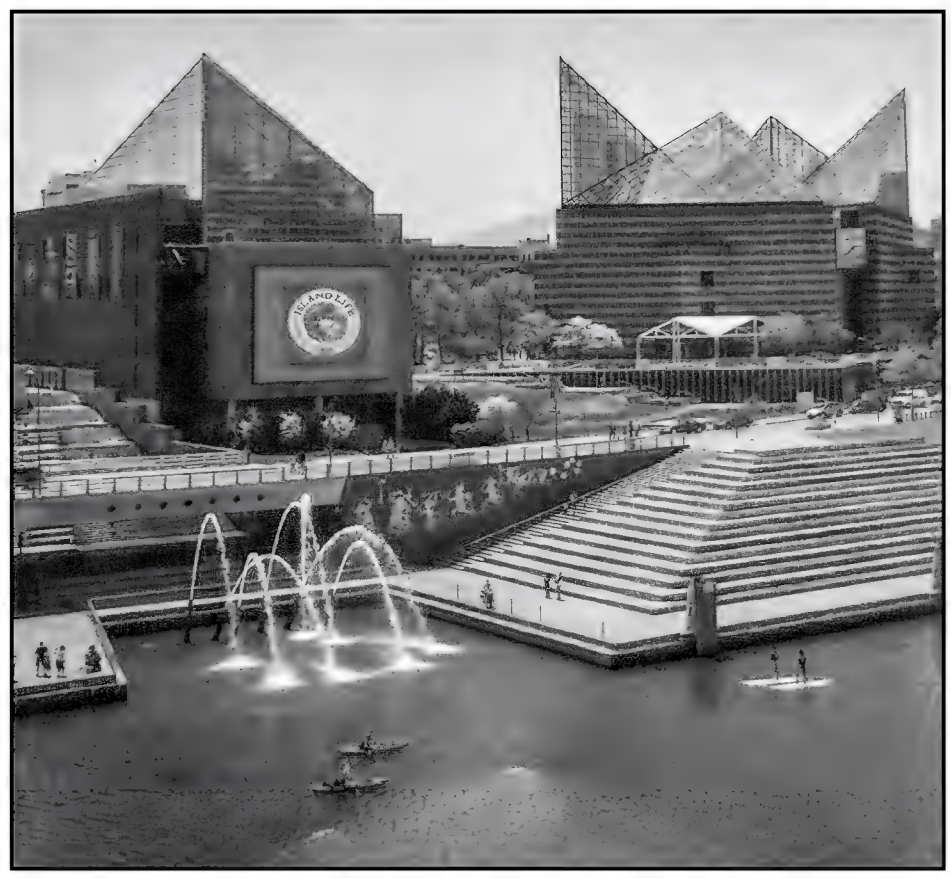
While on vacation, my wife Holly and I stopped to see our friend Dave Stahl, who took us to the Tennessee Aquarium in Chattanooga for most of the day. The Tennessee Aquarium has some live herps, a few frogs, toads, lizards and turtles and some herp art.

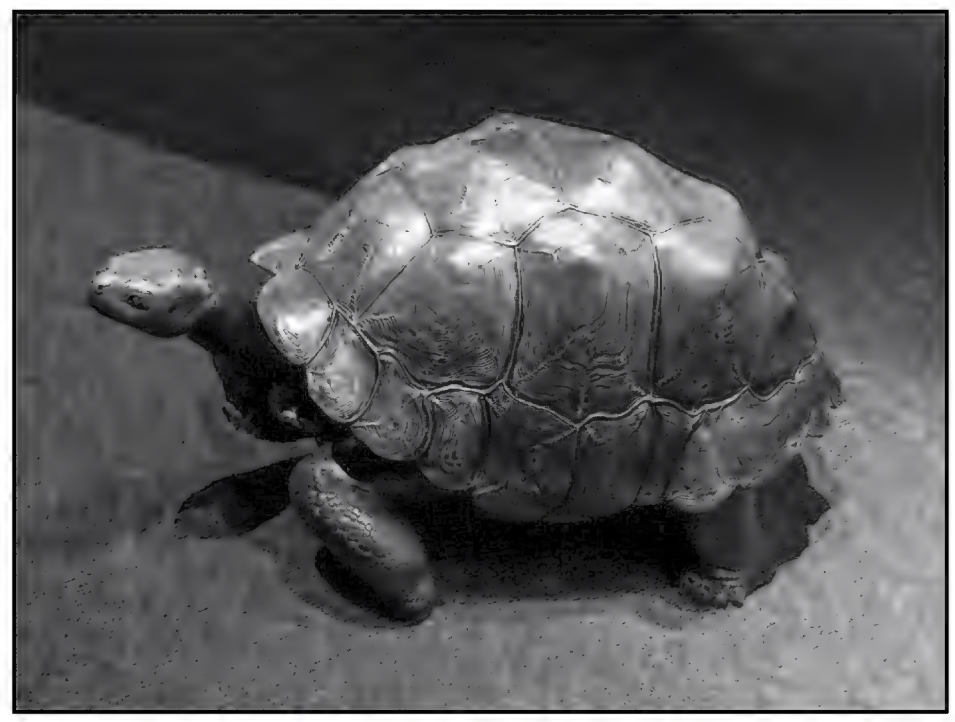
The first artwork we saw was a large statue of a treefrog mounted on a wall. It was identified by a poster that said "Pine Barrens Treefrog, *Hyla andersonii*, this rare frog is found in widely scattered and isolated populations from southern New Jersey to Florida. An adult is just 1½ inches long." For this species, this statue is colored correctly.

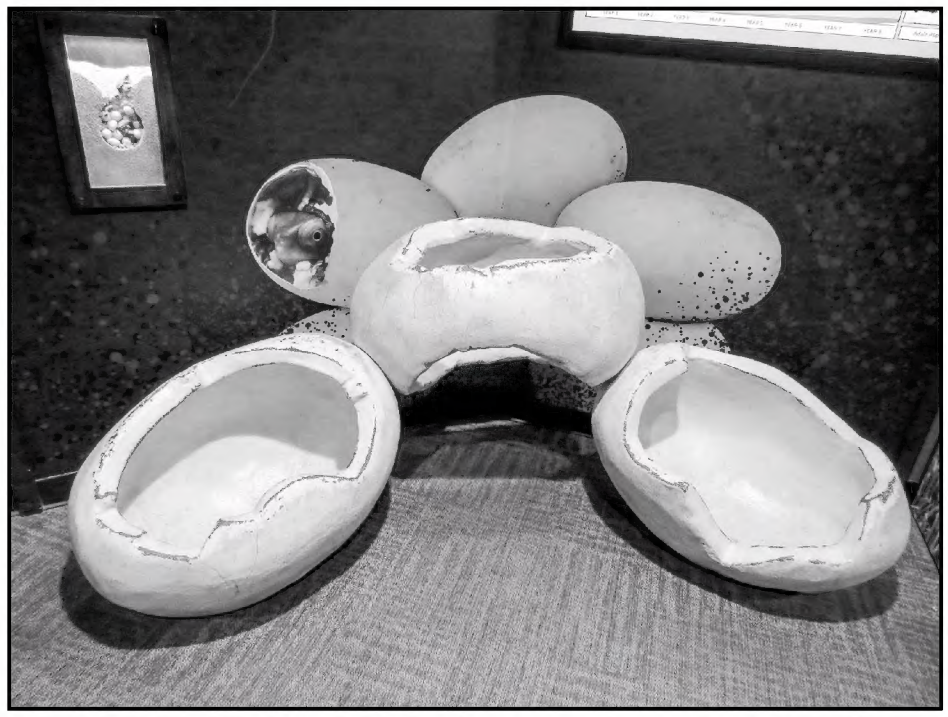


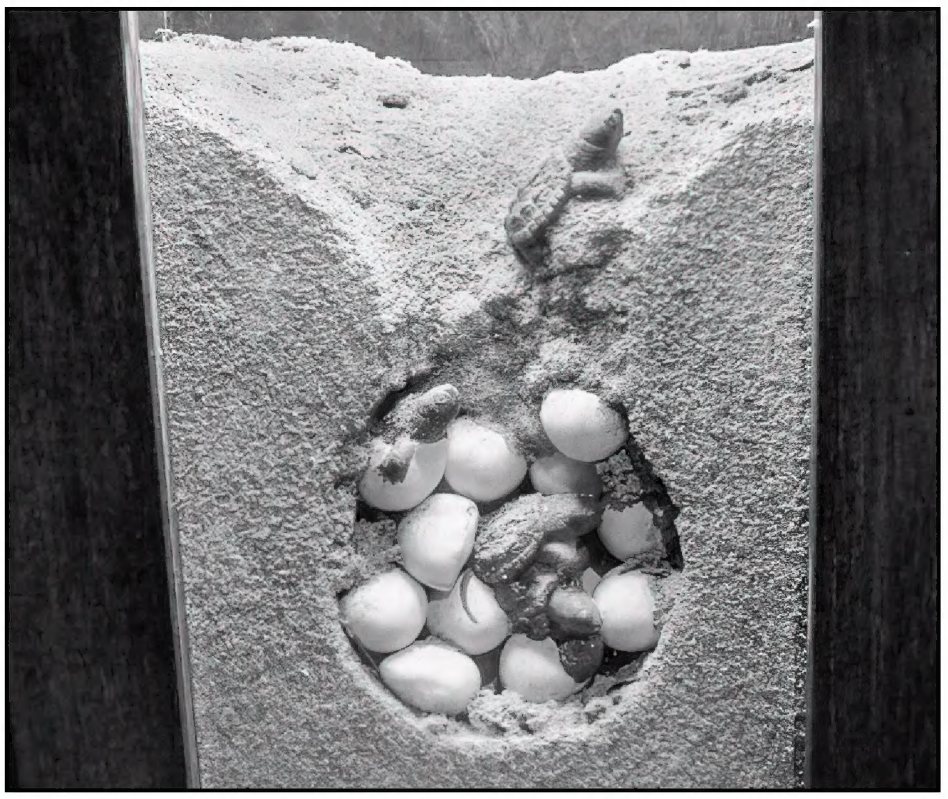
There is a bronze statue of a Galapagos tortoise with a sign that says, "This sculpture was created by artists Rita and Rick Hadley. They were inspired by Sam, a real Galapagos tortoise. Sam lives at the Scovill Zoo in Decatur, Illinois." This picture is darker than I like because I was told no flash photography. This statue seems to be the size of a real Galapagos tortoise. I found details about Sam on the web site for the Scovill Zoo.

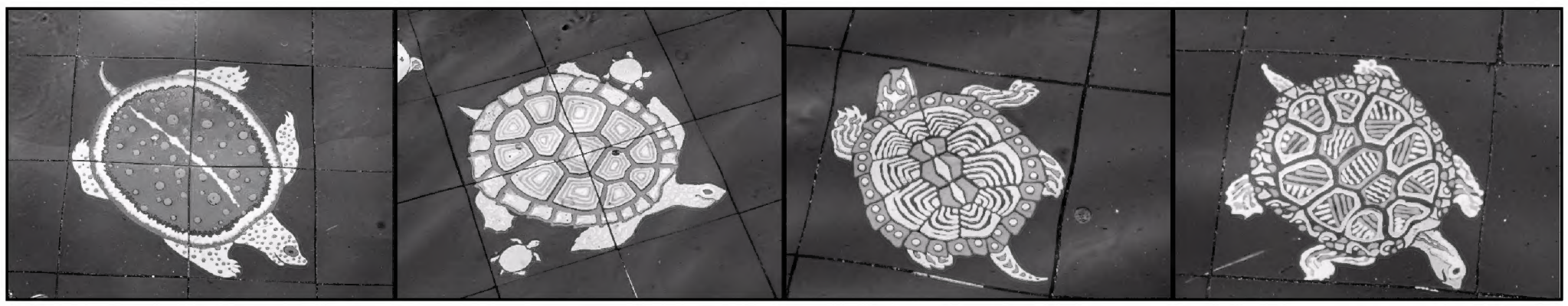
Another large exhibit shows turtle eggs that have hatched, which are approximately four feet long. Three of these "eggs" have gaps in them to allow small children to climb into them for their parents to photograph. Behind these three eggs are pictures of eggs that haven't hatched plus one that is hatching showing a baby turtle still in the egg. Nearby is a diorama that shows snapping turtle, *Chelydra serpentina*, eggs hatching with one hatchling climbing out of the nest and a few others still in the nest. The eggs and baby turtles seem to be the correct size for this display.

In the Aquarium there are several walkways for visitors to go from one large tank to another to see different fish and one of these walkways is at the edge of a floor that has several inches of water with the images of what may be at least a couple dozen turtles on the floor. There is a sign that says, "Parade of Turtles Created by Chattanooga artist Jane Yelliott." I can't tell if these turtle images are painted or maybe tiles. These are very colorful with various shades of yellow, orange, red and blue but don't represent any real turtles. Initially I was taking photographs of these turtles without using my camera's flash, but these pictures weren't very clear, so I started taking pictures with the flash, not intending to photograph every image, when I heard someone say, "No flash photography." I apologized, but I did get a few photographs that I liked.









Herpetology 2022

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

GOPHER TORTOISES IN SOUTHERN FLORIDA

T. D. Castellón et al. [2022, Chelonian Conservation and Biology 21(1):112-121] report that in the southern half of peninsular Florida, where longleaf pine (*Pinus palustris*) sandhill communities are scarce, gopher tortoises (*Gopherus polyphemus*) primarily occupy mesic flatwoods and Florida scrub habitats that appear suboptimal due to poorly drained soils in flatwoods and low forage abundance in scrub. Tortoise populations persist in these habitats, but their demography is poorly understood. The authors used burrow size-class distributions to assess population age structure in flatwoods and scrub habitats. In addition, they monitored tortoise nests and burrows with automated cameras to assess nest fate and predators. Burrows in flatwoods were strongly skewed toward adult size classes, suggesting low juvenile recruitment, which may be due to poor nest success caused by surface flooding or saturated soils. Size class distributions in scrub were also skewed but were closer to the expected range for a long-lived species with slowed growth following maturity. Rates of predator visitation did not differ between habitats but nests in flatwoods were inundated by heavy rains. More research is needed to clarify the demographics of gopher tortoises in the southernmost extent of their range. However, the authors suspect that some negative consequences of suboptimal conditions may be offset by the warm climate in southern Florida, which may lengthen the growing season, promoting faster growth and earlier age at first reproduction that could boost population growth.

HAWKSBILL TURTLES IN CUBAN WATERS

F. Moncada et al. [2022, Chelonian Conservation and Biology 21(1):20-27] studied immature hawksbill turtles, *Eretmochelys imbricata*, in Jardines de la Reina Archipelago, the principal area of distribution for this species in Cuban waters. Hawksbill areas of occurrence, size composition, scope of movement range, and somatic growth rates are presented. A total of 496 individuals were caught while diving or with nets at depths of 0.5–2.5 m. Differences in size distribution were observed among survey areas within the Jardines de la Reina Archipelago. Mean curved carapace lengths were 35.6 ± 9.6 cm and 59.6 ± 7.7 cm for hawksbills captured in the external and internal cays, respectively. Forty-two individuals were recaptured between 1 and 4 times at intervals averaging 554.9 d. For recaptured turtles, 91% were encountered within < 1 km of their original capture location. The study's findings indicate that the benthic habitats of Jardines de la Reina Archipelago are favorable for the recruitment of juvenile hawksbill turtles transitioning from pelagic habitats. The data also show that hawksbills are distributed throughout the Jardines de la Reina Archipelago study region, and that coastal foraging areas within this region host small, postpelagic juveniles as well as larger immature hawksbills that have been resident for extended periods.

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UPCOMING MEETINGS

From now on the monthly meetings of the CHS will be held in the afternoon on the third Sunday of each month. The meetings will begin at 2:00 P.M. The next meeting will take place on October 18. Please try to join us online or *in person* at the Notebaert Nature Museum, 2430 N. Cannon Drive, Chicago..

The program for the November 20 meeting has not yet been confirmed.

Please check the CHS website or Facebook page each month for information on the program. Information about attending a Zoom webinar can be found here:
<https://support.zoom.us/hc/en-us/articles/115004954946-Joining-and-participating-in-a-webinar-attendee->

Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? The next board meeting will be held online. If you wish to take part, please email: jarcher@chicagoherp.org.

REMINDER

When you shop AmazonSmile and select the Chicago Herpetological Society as your charity, Amazon will make a donation to the CHS. <https://smile.amazon.com/>

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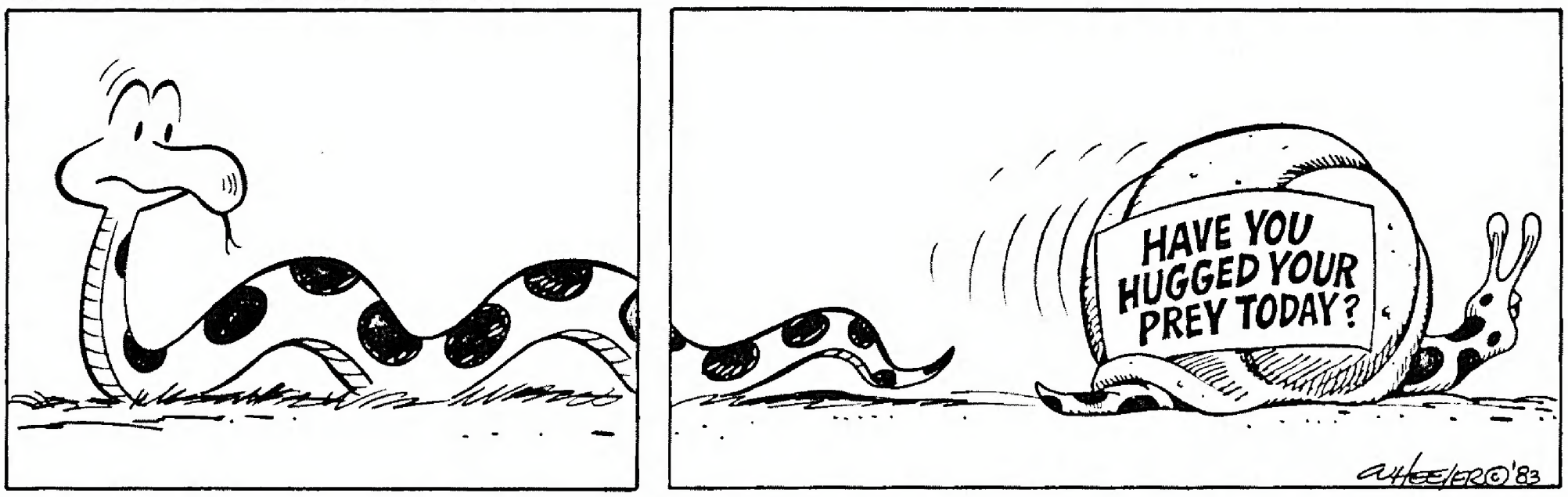

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